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SOLAR/1025-79/02



Monthly Performance Report

HELIO THERMICS, INC. - LOT 6

FEBRUARY 1979



U.S. Department of Energy

National Solar Heating and
Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT

HELIO-THERMICS, INC.
HOUSE LOT 6

FEBRUARY 1979

I. SYSTEM DESCRIPTION

The Helio-Thermics Inc., House Lot 6 is one of two instrumented single-family residences in Greenville, South Carolina. The home has approximately 1086 square feet of conditioned space. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system utilizes the attic space as the solar energy collector. The attic roof faces 10 degrees west of south and is pitched at an angle of 51 degrees from the horizontal. Solar energy enters the attic through a 416-square-foot aperture which is double-glazed with corrugated, translucent, fiberglass-reinforced, acrylic panels. The interior of the attic is painted black to maximize the absorption of solar energy. Warm air accumulates in the peak of the attic roof and circulates through the conditioned space or through storage by an air handler. Solar energy is stored in an 870-cubic-foot storage bin containing 85,460 pounds of crushed rock. The bin is located under the house and is insulated with 2-inch polystyrene insulation. Cold water is preheated in the attic by thermosiphoning water from the 80-gallon preheat tank through a manifold system of copper tubes. These tubes are attached to black sheet-metal plates, thus enhancing absorption of solar radiation for preheating the water as it circulates to and from the preheat tank. Preheated city water is stored in the preheat tank and supplied, on demand, to a conventional 80-gallon DHW tank. When solar energy is insufficient to satisfy the space heating load, a water-to-air heat exchanger in the hot air supply-duct provides auxiliary energy for space heating. A gas-fired water heater provides auxiliary energy for the water-to-air heat exchanger and DHW. The system, shown schematically in Figure 1, has seven modes of operation.

Mode 1 - Collector-to-Storage: This mode activates when there is no demand for space heating and the collector supply-duct temperature is 26°F higher than the storage temperature. This mode terminates when the temperature difference between the collector and storage is less than 16°F.

Mode 2 - Storage-to-Space Heating: This mode activates when space heating is required (but is not available from the collector) and the storage temperature exceeds the building ambient temperature by 5°F. This mode terminates when the building ambient temperature equals the storage temperature or when space heating is no longer required.

Mode 3 - Collector-to-Space Heating: This mode activates when space heating is required and the collector supply-duct air temperature is 10°F higher than the building ambient air temperature. This mode terminates when the temperature difference drops to less than 6°F or the space heating requirement is satisfied.

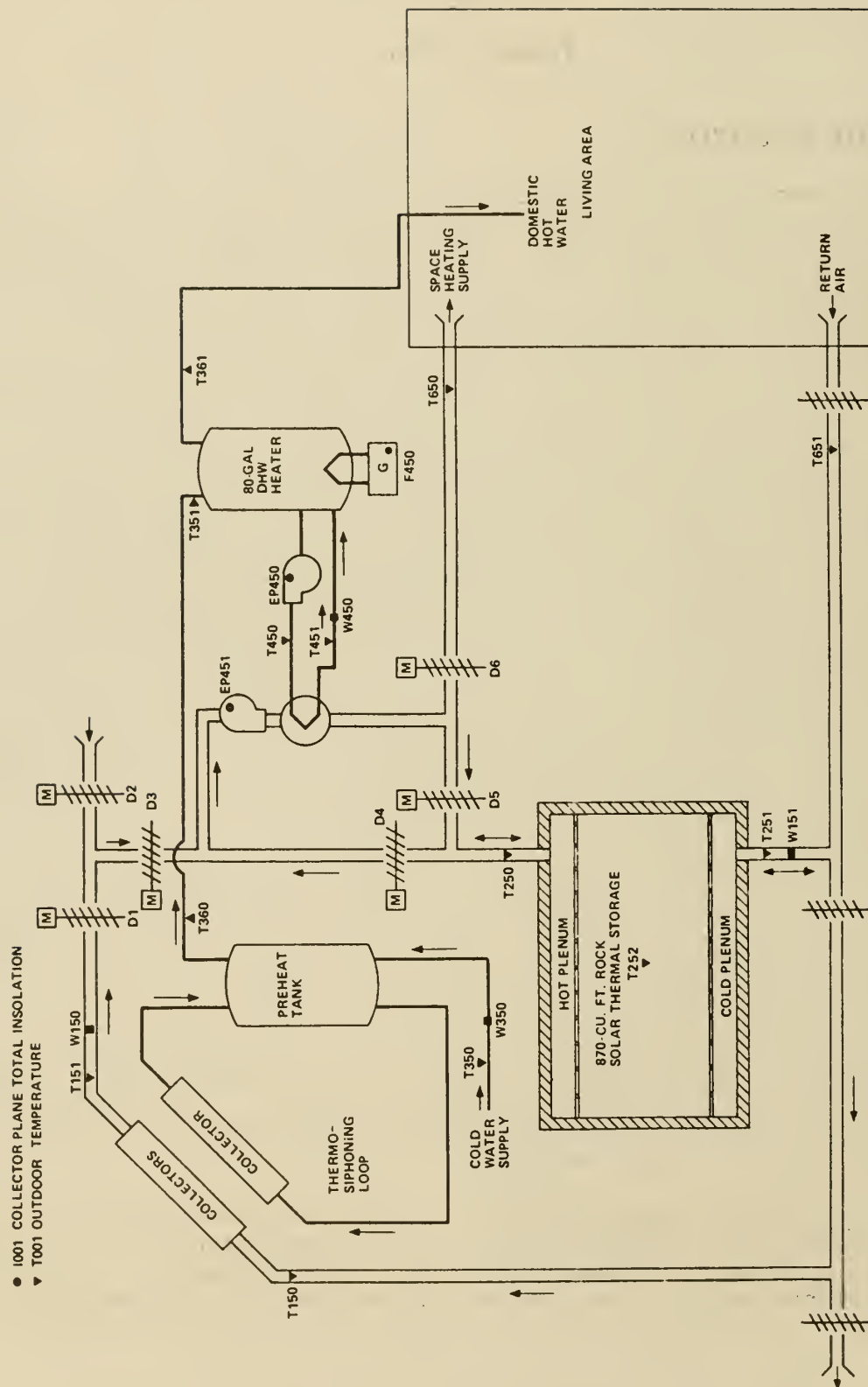


Figure 1. HELIO THERMICS, INC., LOT NO. 6, SOLAR ENERGY SYSTEM SCHEMATIC

Mode 4 - Auxiliary Energy-to-Space Heating: This mode activates when space heating is required and thermal energy is not available from the collectors or storage. An electrical heating element in the hot air supply-duct remains on until the space heating demand is satisfied.

Mode 5 - Summer Mode, Passive Cooling Storage: This mode can be activated when the residents wish to store cool air in storage for circulation the next day. The air-handler fan activates and an outside air-intake damper opens to allow the cool air to circulate through the attic and storage.

Mode 6 - Summer Mode, Space Cooling: This mode can be activated when cool air from storage is desired in the living area. The outside air-intake damper closes, the duct to the living area opens, and the air-handler fan activates.

Mode 7 - DHW Preheating: This mode activates when there is a demand for hot water. Water is drawn from the conventional DHW tank and replenished with heated water from the preheat tank. The DHW subsystem has this one independent mode of operation for preheating.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied during the month of February and the solar energy system operated continuously during the month. The measurable solar energy satisfied 14 percent of the space heating requirements. The solar energy system provided fossil fuel energy savings of 1.1 million Btu.

To prevent the possibility of water freezing in the thermosiphoning subsystem, this solar energy system component (located in the attic) has been drained until warmer weather.

In this report the space heating load represents data from the last 14 days of February which was used and extrapolated to reflect the entire month. Because the average ambient temperature for the last 14 days was 43°F and the average for the first 14 days was 33°F, a significant bias has been introduced to some monthly totals. However, the data will provide some insight into solar energy system performance.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 13.3 million Btu for a daily average of 1146 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during February of 1715 Btu per square foot for a south-facing plane with a tilt of

51 degrees to the horizontal. The average ambient temperature during February was 38°F as compared with the long-term average for February of 44°F. The number of heating degree-days for the month (based on a 65°F reference) was 757, as compared with the long-term average of 577.

THERMAL PERFORMANCE

Collector - The total incident solar radiation on the collector array for the month of February was 13.3 million Btu. During the period the collector loop was operating, the total insolation amounted to 9.4 million Btu. The total collected solar energy for the month of February was 2.7 million Btu, resulting in a collector array efficiency of 20 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 2.0 million Btu. Energy loss during transfer from the collector array to storage and loads was 0.19 million Btu. This loss represented 7 percent of the energy collected. Operating energy required by the collector loop was 0.18 million Btu.

Storage - Solar energy delivered to storage was 2.0 million Btu. There were 0.20 million Btu delivered from storage to the space heating subsystem. Energy loss from storage was 1.7 million Btu. This loss represented 82 percent of the energy delivered to storage. This "lost" thermal energy is probably entering the living area and contributing to the lower-than-expected space heating load. The predicted space heating load based upon actual ambient temperature was 5.7 million Btu, considerably higher than the actual load of 2.9 million Btu. The storage efficiency was 18 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 64°F.

DHW Load - The DHW load was 2.4 million Btu, of which there was no solar contribution because the thermosiphoning subsystem was drained. A daily average of 91 gallons of DHW was consumed at an average temperature of 153°F delivered from the DHW tank.

Space Heating Load - The space heating subsystem consumed 0.68 million Btu of solar energy and 4.1 million Btu of auxiliary fossil fuel energy to satisfy a space heating load of 2.9 million Btu. This space heating load total reflects the bias introduced by using the last half of the February data as the basis for computing the monthly total. The solar fraction of this load was 14 percent. The space heating subsystem consumed a total of 0.58 million Btu of operating energy in order to distribute both solar energy and auxiliary thermal energy.

OBSERVATIONS

The instrumentation anomalies which created the need to extrapolate data have been corrected as a result of a site visit by IBM on February 14. Although unrelated, it was observed on February 16 that the gas totalizer used to

quantify the gas consumption is not providing valid data. The measurement of auxiliary thermal energy consumption in the DHW subsystem will not be available until this problem is corrected.

ENERGY SAVINGS

The solar energy system provided a total fossil fuel energy savings of 1.1 million Btu.

III. ACTION STATUS

Boeing will schedule a site visit in the near future in order to correct the erroneous gas totalizer data readings.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SITE SUMMARY

SITE: HELIOTHERMICS, INC., LOT 6, GREENVILLE, SC
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1025-79/02

SITE/SYSTEM DESCRIPTION: ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER PREHEATING. IN THE SPACE HEATING SUBSYSTEM, THERMAL ENERGY IS TRANSFERRED BY AIR CIRCULATION FROM THE ATTIC TO THE LOAD OR TO WATER CRUSHED ROCK IN AN INSULATED CONCRETE BIN. IN THE DOMESTIC HOT WATER SUBSYSTEM, SOLAR ENERGY IS COLLECTED FROM A 70 SQ. FT ALUMINUM AND COPPER PADDLE IN THE ATTIC AND TRANSFERRED TO AN 80 GAL. PREHEAT TANK BY THERMOSIPHONING. AUXILIARY ENERGY IS PROVIDED TO BOTH SUBSYSTEMS BY A COMMON NATURAL GAS WATER HEATER.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	13.348	MILLION BTU
COLLECTED SOLAR ENERGY	32088	BTU/SQ. FT.
AVERAGE AMBIENT TEMPERATURE	2.704	MILLION BTU
AVERAGE BUILDING TEMPERATURE	6500	BTU/SQ. FT.
ECSS SOLAR CONVERSION EFFICIENCY	38	DEGREES F
ECSS OPERATING ENERGY	69	DEGREES F
TOTAL SYSTEM OPERATING ENERGY	0.05	MILLION BTU
TOTAL ENERGY CONSUMED	0.177	MILLION BTU
	0.759	MILLION BTU
	7.848	MILLION BTU

SUBSYSTEM SUMMARY:

LOAD	HOT WATER	HEATING	COOLING
SOLAR FRACTION USED	2.359	2.849	N.A.
SOLAR ENERGY USED	0	14	N.A.
OPERATING ENERGY	0.000	0.680	N.A.
AUX. THERMAL ENERGY	N.A.	0.581	N.A.
AUX. ELECTRIC FUEL	4.254	2.438	N.A.
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.
ELECTRIC FUEL SAVINGS	7.090	4.063	N.A.
FOSSIL SAVINGS	N.A.	-0.214	N.A.
	0.000	1.133	N.A.

SYSTEM PERFORMANCE FACTOR:

0.79

* DENOTES UNAVAILABLE DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978,
SOLAR/0004-78/18
READ THIS BEFORE TURNING PAGE

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT SITE SUMMARY

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1025-79/02

SITE/SYSTEM DESCRIPTION: THE HELIOTHERMICS SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER PREHEATING. IN THE SPACE HEATING SUBSYSTEM, THERMAL ENERGY IS TRANSFERRED BY AIR CIRCULATION FROM THE ATTIC TO THE LOAD OR TO CRUSHED ROCK IN AN INSULATED CONCRETE BIN. IN THE DOMESTIC HOT WATER SUBSYSTEM, SOLAR ENERGY IS COLLECTED FROM A 70 SQ. FT ALUMINUM AND COPPER PADDOLE IN THE ATTIC AND TRANSFERRED TO AN 80 GAL. PREHEAT TANK BY THERMOSIPHONING. AUXILIARY ENERGY IS PROVIDED TO BOTH SUBSYSTEMS BY A COMMON NATURAL GAS WATER HEATER.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY 14.083 GIGA JOULES
COLLECTED SOLAR ENERGY 364401 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE 2.852 GIGA JOULES
AVERAGE BUILDING TEMPERATURE 73820 KJ/SQ.M.
ECSO SOLAR CONVERSION EFFICIENCY 3 DEGREES C
ECSO OPERATING ENERGY 0.05
TOTAL SYSTEM OPERATING ENERGY 0.187 GIGA JOULES
TOTAL ENERGY CONSUMED 0.801 GIGA JOULES
8.279 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING
LOAD	2.489	3.006	N.A.
SOLAR FRACTION USED	0	14	N.A.
SOLAR ENERGY USED	0.000	0.717	N.A.
OPERATING ENERGY	N.A.	0.613	N.A.
AUX. THERMAL ENG	4.488	2.572	N.A.
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.
AUX. FOSSIL FUEL	7.480	4.286	N.A.
ELECTRICAL SAVINGS	N.A.	-0.225	N.A.
FOSSIL SAVINGS	0.000	1.195	N.A.

SYSTEM PERFORMANCE FACTOR:

0.79

* DENOTES UNAVAILABLE DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT
OF THE NATIONAL SOLAR DATA PROGRAM, FEBRUARY 28, 1978,
SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: HELIOTHERMICS, INC., LOT 6, GREENVILLE, SC
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1025-79/02

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.899	26	0.088	NOT APPLICABLE	0.012	NOT APPLICABLE	0.098
2	0.662	28	0.051		0.010		0.078
3	0.086	38	0.008		0.000		0.102
4	0.794	43	0.023		0.011		0.029
5	0.252	34	0.041		0.000		0.165
6	0.053	30	0.000		0.000		0.002
7	0.092	32	0.000		0.007		0.009
8	0.842	32	0.016		0.011		0.020
9	0.874	31	0.034		0.011		0.040
10	0.822	25	0.065		0.012		0.080
11	0.870	30	0.047		0.005		0.054
12	0.543	38	0.052		0.009		0.096
13	0.632	38	0.021		0.002		0.034
14	0.271	38	0.022		0.002		0.082
15	0.202	54	0.000		0.012		0.002
16	0.510	59	0.001		0.000		0.002
17	0.306	33	0.039		0.000		0.130
18	0.077	20	0.011		0.000		0.141
19	0.926	32	0.015		0.011		0.016
20	0.788	36	0.016		0.011		0.021
21	0.060	41	0.029		0.000		0.481
22	0.359	51	0.000		0.008		0.000
23	0.076	52	0.005		0.000		0.072
24	0.043	50	0.000		0.000		0.001
25	0.189	47	0.003		0.003		0.019
26	0.390	39	0.014		0.001		0.037
27	0.935	41	0.018		0.014		0.019
28	0.783	45	0.050		0.015		0.065
SUM	13.348	-	0.680	N.A.	0.177	N.A.	-
AVG	0.476	38	0.024	N.A.	0.006	N.A.	0.051
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT COLLECTOR ARRAY PERFORMANCE

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC SOLAR/1025-79/02
REPORT PERIOD: FEBRUARY, 1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.899	0.754	0.207	40	0.230
2	0.662	0.516	0.151	44	0.228
3	0.686	0.000	0.000	42	0.000
4	0.794	0.726	0.240	54	0.303
5	0.252	0.012	0.001	43	0.005
6	0.053	0.000	0.000	33	-0.012
7	0.092	0.000	0.000	33	0.000
8	0.842	0.568	0.062	44	0.074
9	0.874	0.737	0.120	37	0.138
10	0.822	0.651	0.173	39	0.211
11	0.870	0.735	0.225	41	0.259
12	0.543	0.364	0.089	47	0.166
13	0.632	0.432	0.139	* #	0.220
14	0.271	0.088	0.030	* #	0.114
15	0.202	0.094	0.016	60	0.082
16	0.510	0.419	0.207	69	0.407
17	0.306	0.025	0.003	34	0.011
18	0.077	0.000	0.000	18	0.000
19	0.926	0.680	0.078	45	0.085
20	0.788	0.627	0.164	52	0.209
21	0.060	0.000	0.000	41	-0.003
22	0.359	0.227	0.111	59	0.310
23	0.076	0.000	0.000	52	0.000
24	0.043	0.000	0.000	50	0.000
25	0.189	0.105	0.025	51	0.135
26	0.390	0.143	0.026	45	0.068
27	0.935	0.816	0.338	55	0.362
28	0.783	0.672	0.289	55	0.369
SUM	13.348	9.402	2.704	-	-
AVG	0.476	0.335	0.096	45	0.203
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT STORAGE PERFORMANCE

SITE: HELIOTHERMICS, INC., LOT 6, GREENVILLE, SC SOLAR/1025-79/02
REPORT PERIOD: FEBRUARY, 1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORAGE ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.139	0.068	-0.037	64	0.221
2	0.100	0.036	-0.006	63	0.300
3	0.000	-0.019	-0.006	63	1.000
4	0.175	-0.007	0.056	65	0.278
5	0.000	0.018	-0.039	64	-98.757
6	0.000	-0.016	-0.008	64	779.791
7	0.000	-0.022	-0.020	63	1.000
8	0.059	-0.005	0.010	62	0.091
9	0.103	0.017	0.006	63	0.234
10	0.133	0.044	0.000	63	0.335
11	0.153	0.030	0.010	64	0.268
12	0.057	0.030	-0.011	63	0.325
13	0.114	0.018	-0.011	64	0.261
14	0.021	0.011	-0.002	63	0.426
15	0.013	0.020	0.014	64	-0.435
16	0.165	-0.015	-0.015	67	-0.489
17	0.000	0.036	0.096	66	-322.310
18	0.000	0.000	-0.094	66	1.000
19	0.093	-0.006	-0.033	63	0.061
20	0.136	0.012	0.012	64	0.357
21	0.000	0.017	-0.027	64	-801.862
22	0.075	-0.019	0.031	65	0.165
23	0.000	0.001	-0.010	66	1.000
24	0.000	-0.017	-0.006	65	1.000
25	0.017	-0.020	-0.010	65	-1.726
26	0.006	-0.024	-0.004	65	-4.285
27	0.240	0.000	0.113	64	0.468
28	0.226	0.048	0.092	70	0.622
SUM	2.035	0.198	0.172	-	-
AVG	0.072	0.007	0.006	64	0.182
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPCRT HOT WATER SUBSYSTEM

SITE: HELIOTHERMICS, INC., LOT 6, GREENVILLE, SC
REPORT PERIOD: FEBRUARY, 1979

SOLAR/1025-79/02

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER.	SOLAR ENERGY USED MILLION BTU	OPER. ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.067	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	43	141	70
2	0.036	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	40	151	41
3	0.113	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	45	150	152
4	0.035	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	49	153	48
5	0.044	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	44	148	93
6	0.090	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	39	148	75
7	0.073	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	38	156	140
8	0.133	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	41	153	89
9	0.081	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	40	156	25
10	0.022	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	36	152	55
11	0.047	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	39	144	77
12	0.066	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	43	147	134
13	0.119	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	46	144	143
14	0.134	*	0.000	NOT	NOT	*****	0.000	NOT	0.000	45	153	67
15	0.059	0	0.000	0.008	0.013	0.013	0.000	0.000	0.000	51	156	47
16	0.036	0	0.000	0.167	0.278	0.278	0.000	0.000	0.000	57	149	124
17	0.131	0	0.000	0.000	0.350	0.350	0.000	0.000	0.000	42	154	133
18	0.142	0	0.000	0.210	0.164	0.164	0.000	0.000	0.000	31	163	101
19	0.096	0	0.000	0.098	0.500	0.500	0.000	0.000	0.000	34	155	157
20	0.145	0	0.000	0.300	0.006	0.006	0.000	0.000	0.000	43	159	81
21	0.080	0	0.000	0.003	0.228	0.228	0.000	0.000	0.000	40	161	136
22	0.129	0	0.000	0.137	0.000	0.000	0.000	0.000	0.000	50	156	107
23	0.096	0	0.000	0.000	0.466	0.466	0.000	0.000	0.000	53	159	72
24	0.065	0	0.000	0.279	0.005	0.005	0.000	0.000	0.000	50	159	58
25	0.051	0	0.000	0.003	1.342	1.342	0.000	0.000	0.000	47	161	132
26	0.125	0	0.000	0.805	0.000	0.000	0.000	0.000	0.000	47	155	32
27	0.029	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	50	149	118
28	0.103	0	0.000	0.113	0.188	0.188	0.000	0.000	0.000	50	149	118
SUM	2.359	-	0.000	4.254	7.090	7.090	0.000	N.A.	0.000	-	-	2547
AVG	0.084	0	0.000	0.151	0.253	0.253	0.000	N.A.	0.000	44	153	91
NBS	Q302	N300	Q300	Q301	Q305	Q306	Q311	Q313	N305	N307	N308	-

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SOLAR/1025-79/02

SITE: HELIOTHERMICS, INC., LCT 6, GREENVILLE, SC
REPORT PERIOD: FEBRUARY, 1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR. OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	*	*	0.088	0.032	*	NOT	*	*	0.147	67	26
2	*	*	0.051	0.031	*	AP	*	*	0.086	67	28
3	*	*	0.008	0.019	*	P	*	*	0.014	68	38
4	*	*	0.023	0.005	*	L	*	*	0.038	69	43
5	*	*	0.041	0.023	*	I	*	*	0.069	68	34
6	*	*	0.000	0.008	*	C	*	*	0.000	68	30
7	*	*	0.000	0.015	*	A	*	*	0.001	67	32
8	*	*	0.016	0.016	*	B	*	*	0.027	68	32
9	*	*	0.034	0.015	*	L	*	*	0.057	67	31
10	*	*	0.065	0.036	*	E	*	*	0.109	67	30
11	*	*	0.047	0.027	*	E	*	*	0.078	69	38
12	*	*	0.052	0.025	*	E	*	*	0.087	68	38
13	*	*	0.021	0.021	*	E	*	*	0.036	69	35
14	*	*	0.022	0.027	*	E	*	*	0.000	70	34
15	0.051	15	0.000	0.007	0.050		0.084	-0.001	0.000	72	59
16	0.025	30	0.001	0.003	0.024		0.041	-0.000	0.002	69	33
17	0.133	40	0.039	0.036	0.093		0.155	-0.022	0.066	69	20
18	0.284	10	0.011	0.048	0.273		0.455	-0.009	0.185	69	32
19	0.155	16	0.015	0.026	0.140		0.233	-0.012	0.027	69	36
20	0.103	25	0.016	0.025	0.087		0.145	-0.016	0.048	69	41
21	0.116	20	0.029	0.029	0.087		0.145	-0.000	0.000	71	51
22	0.067	20	0.005	0.008	0.067		0.035	-0.006	0.009	71	52
23	0.027	0	0.000	0.010	0.021		0.112	-0.000	0.000	69	50
24	0.067	0	0.000	0.009	0.067		0.149	-0.003	0.005	69	47
25	0.093	4	0.003	0.015	0.089		0.232	-0.002	0.024	69	39
26	0.153	9	0.014	0.020	0.139		0.127	-0.008	0.030	68	41
27	0.094	19	0.018	0.018	0.076		0.000	-0.015	0.084	70	45
28	0.050	100	0.050	0.015	0.000		0.000				
SUM	2.849	-	0.680	0.581	2.438	N.A.	4.063	-0.214	1.133	-	-
AVG	0.101	14	0.024	0.020	0.087	N.A.	0.145	-0.007	0.040	69	38
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MCNTHLY REPORT ENVIRONMENTAL SUMMARY

SITE: HELIOTHERMICS, INC. LOT 6, GREENVILLE, SC		SOLAR/1025-79/02				
REPORT PERIOD: FEBRUARY, 1979		TOTAL INSULATION BTU/SQ. FT	DIFFUSE INSULATION BTU/SQ. FT	AMBIENT TEMPERATURE DEG F	CAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT
DAY OF MONTH						
1	2162		NOT	26	40	NOT
2	1593			28	44	
3	208			38	42	
4	1911			43	54	
5	607			34	43	
6	128			30	33	
7	2225			32	33	
8	2025			31	47	
9	2102			25	39	
10	1976			30	41	
11	2092			38	47	
12	1306			38	*	
13	1521			38	*	
14	652			38		
15	487			54	60	
16	1226			55	69	
17	737			33	34	
18	187			30	18	
19	2227			32	45	
20	1895			36	52	
21	146			41	41	
22	864			51	59	
23	185			52	50	
24	105			50	51	
25	455			39	45	
26	938			41	55	
27	2249			45	55	
28	1883					
SUM	32089		N.A.	-	-	-
AVG	1146		N.A.	38	45	N.A.
NBS ID	Q001			N113	N115	N114

* DENOTES UNAVAILABLE DATA.
N.A. DENOTES NOT APPLICABLE DATA.

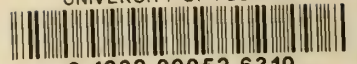








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